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Insects and mites on alfalfa in Alberta

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Insects and mites on alfalfa in Alberta

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SUMMARY

Four hundred and thirty-seven species of insects and nine species of mites have been collected from alfalfa grown in Alberta. The species are in 10 orders and 88 families. A number of the insects are pests of alfalfa or potential pests and many are predators or parasites. The significance of many of the insects has not been determined, nor have their interrelationships within the alfalfa ecosystem.

RÉSUMÉ

Quatre cent trente-sept espèces d'insectes et neuf d'espèces d'acariens ont été prélevés de champs de luzerne cultivés en Alberta. Les espèces font partie de 10 ordres et de 88 familles. Un certain nombre des insectes sont des ravageurs de la luzerne ou pourraient l'être et beaucoup sont des prédateurs ou des parasites. Le degré d'infestation de bon nombre de ces insectes reste à été déterminer, de même leur rôle dans l'écosystème de la luzerne.

INTRODUCTION

There are 2.9 million hectares of alfalfa and alfalfa-grass hay grown in Canada, of which the province of Alberta produces about 25%. Although cultivated forage is produced on less than 25% of the forage land base, it accounts for 70% of the feed supply. Alfalfa is the most important and widely grown legume in Canada and is extremely important as an inexpensive plant protein source for beef and milk production. Losses due to insects could severely disrupt the forage-livestock system, especially in southern Alberta where alfalfa is produced on high-value irrigated land.

There is limited knowledge about alfalfa insects in Alberta. Studies have been conducted on *Adelphocoris* (Lilly and Hobbs 1956), aphids (Harper and Kaldy 1982, Harper and Lilly 1966), bumble bees (Hobbs 1950), chemical control (Harper 1978), insect transmission of disease (Huang et al. 1983, Harper and Huang 1984), lygus (Salt 1945) and leafcutter bees (Hobbs and Lilly 1954, Hobbs 1968). Craig (1973) and Harper (1981) published papers on alfalfa insect pests of the Canadian prairies. Information on the importance or relationships of some of the species has been obtained from Bierne (1971, 1972), Borrer and DeLong (1963), Essig (1947), Fluke (1929), Hodek (1973), Pimental and Wheeler (1973), and Stary (1974).

This paper lists insects that have been found on alfalfa in Alberta and indicates the significance of the species that appear important to the crop. The insects were collected by sweep net, suction sampler, or by pitfall traps in the interior of alfalfa fields.

INSECTS IN ALFALFA

Collembola - Springtails

Poduridae

Hypogastrura manubrialis (Tullberg)

Sminthuridae

Bourletiella hortensis (Fitch)
Deuterosminthurus repandus (Agren.)
Sminthurinus elegans (Fitch)
Sminthurinus medialis (Mills)

The Collembola appear to be of little importance in alfalfa. Species in the family Poduridae, and the garden springtail, *B. hortensis*, may feed on seedlings of a wide variety of crops. *D. repandus* feeds on pollen.

Orthoptera - Grasshoppers and crickets

Acrididae

Camnula pellucida (Scudder)
Melanoplus bivittatus (Say)
Melanoplus femurrubrum (DeGeer)
Melanoplus packardii Scudder
Melanoplus sanguinipes (Fabricius)

Tettigoniidae

Anabrus simplex Haldeman

The grasshoppers are sometimes of considerable importance as pests of alfalfa. They can chew off the flowers and pods, greatly lower seed yields and severely reduce hay yields. Grasshoppers most often cause serious damage to irrigated alfalfa where the fields of alfalfa border a dryland area. As the dryland grain or grass matures and becomes undesirable for food, the grasshoppers may move in large numbers to the green alfalfa.

The mormon cricket, *A. simplex*, feeds on plants but has not caused any serious damage to alfalfa in Alberta.

Thysanoptera - Thrips

Aeolothripidae

Aeolothrips fasciatus (Linnaeus)

Chirothripidae

Chirothrips manicatus Haliday
Chirothrips nr *productus*

Phleothripidae

Halothrips malifloris complex

Thripidae

Frankliniella occidentalis (Pergarde)
Frankliniella tritici (Fitch) (*mountonii* Hood)
Limothrips denticornis Haliday
Odontothrips loti (Haliday)
Thrips tabaci Lindeman

A. fasciatus is a very common and important predator in alfalfa and feeds mainly on pest thrips and mites. *F. occidentalis* has been reported to be a predator of alfalfa weevil eggs. *T. tabaci* feeds mainly on onions and *L. denticornis* feeds mainly on grasses and small grains. They do not appear to be important in alfalfa. *O. loti, F. occidentalis* and *F. tritici* are the common pest thrips found on alfalfa.

Hemiptera - True bugs

Anthocoridae

Anthocoris antevolens White
Orius tristicolor (White)
Xylocoris umbrinus Van Duzee

Miridae

Adelphocoris lineolatus (Goeze)
Adelphocoris rapidus (Say)
Adelphocoris superbus (Uhler)
Atomoscelis modestus (Van Duzee)
Capsus simulans (Stal)
Chlamydatus pulicarius (Fallen)
Chlamydatus pullus (Reuter)
Corizus sp.
Deraeocoris brevis (Uhler)
Deraeocoris histrio (Reuter)
Hadronema militaris Uhler
Ilnacora nr *albifrons* Knight
Labops hesperus Uhler
Labops simulans Stal
Litomeris debilis (Uhler)
Lopidea dakota Knight
Lopus sp.
Lygidea sp.
Lygus borealis (Kelton)
Lygus desertinus Knight
Lygus elisus Van Duzee
Lygus lineolaris (Palisot de Beauvois)
Lygus rufidorsus (Kelton)
Lygus shulli (Knight)
Lygus unctuosus Kelton
Melanotrichus coagulatus (Uhler)
Melanotrichus flavosparsus (Sahlberg)
Mimoceps insignis Uhler
Orectoderus obliquus Uhler
Orthotylus fusicornis Knight

Phytocoris pallidicornis Reuter
Plagiognathus obscurus Uhler
Plagniognathus sp.
Polymerus prob. *rufipes* Knight
Slaterocoris prob. *stygicus* Say
Stenodema trispinosa (Reuter)
Stenodema vicinum (Provancher)
Stenodema virens Linnaeus
Trigonotylus coelestialium (Kirkaldy)
Trigonotylus ruficornis (Geoffroy)
Xylocoris umbrinus (Van Duzee)

Phymatidae

Phymata pennsylvania Handl.

Reduviidae

Sinea diadema Fabricius

Nabidae

Dolichonabis propinguus (Reuter)
Nabis alternatus Parshley
Nabis limbatus Dahlbom
Nabis subcoleoptratus (Kirby)
Nabis van duzee Kirk

Tingidae

Acalypta nyctalis Drake
Corythucha coryli O. and D.

Piesmidae

Piesma cinerea Say

Lygaeidae

Cymus luridis Stal
Emblethis vicarius Horvath
Geocoris atricolor Mont.
Geocoris bullatus Say
Geocoris discopterus (Stal)
Geocoris nr *pallens*
Geocoris uliginosis Say
Ligyrocoris sylvestris (Linnaeus)
Lygaeus kalmii Stal
Nysius ericae Schilling
Nysius minutus Uhler
Peritrichus saskatchewanensis Barb.
Slaterobius insignis (Uhler)
Sphragisticus nebulosus (Fall.)
Zeridoneus costalis Van Duzee

Coreidae

Alydus conspersus (Montandon)
Alydus eurinus Say
Coriomerus humulis Uhler
Megalotamus quinquespinosus Say
Rhopalus crassicornis (Linnaeus)
Stictopleuris punctiventris (Dallas)
Stictopleuris viridicatus (Uhler)

Corizidae

Coriza sp.

Saldidae

Saldula palustris (Douglas)

Cydnidae

Corimelaena pulicaria (Germ)
Sehirus cinctus (Palisot de Beauvois)

Scutelleridae

Holcostethus limbolarius Stal
Homaemus aeneifrons consors Uhler

Pentatomidae

Carpocoris remotus Horvath
Codophila remotus (How.)
Coenus delius (Say)
Cosmopepla bimaculata Thomas
Neottiglossa undata Say
Podisus placidus Uhler
Sciocoris microphthalmus Flor.
Thyanta punctiventris Van Duzee

The anthorcorid, *O. tristicolor*, is the most common predator in alfalfa. It feeds on aphids, mites, thrips, and small lepidoptera. *A. antevolens* feeds on similar prey but is only important in localized areas near trees. It is one of the important predators of *Pemphigus* gall aphids on *Populus* sp.

The mirids *D. histrio*, *D. brevis*, and *P. pallidicornis* are predators but are not very common in alfalfa so are probably of limited importance. Kelton (1980) also indicated that *O. obliquus* was probably predaceous. Most of the other species appear to be plant feeders. *A. lineolatus* and the *Lygus* spp. are major pests of alfalfa, especially seed alfalfa. Lilly (1958) showed that *Lygus* spp. can be predatory on aphids.

Chlamydatus, *Labops*, *Stenodema* and *Trigonotylus* species are commonly found in alfalfa but appear to prefer grasses and small grains.

The phymatid *P. pennsylvania* and the reduviid *S. diadema* are both general predators of pests as well as honeybees and other beneficial insects.

The nabids are all predators of aphids, leafhoppers, and other small insects, and lepidopterean eggs and larvae. *N. alternatus* is the most common nabid predator as it can be found in nearly every alfalfa field and is important as a control agent of the pea aphid, *A. pisum*.

The tingids, piesmids and coreids are plant feeders but are not common in alfalfa.

The lygaeid *N. ericae*, the false chinch bug, is commonly found on alfalfa. It is of little importance on that crop but can be important on small grains. *P. saskatchewanensis* feeds on alfalfa and can be readily found in most fields but only ocassionally causes much damage to the crop.

All the species of geocorids listed are predatory. *G. bullatus* is the most common geocorid found in alfalfa.

The saldid *S. palustris* is reported to be a predator of acquatic and semi-aquatic mites and insects.

Some species of the pentatomid genus *Podisus* are predators of hairless lepidoptera.

Homoptera

Membracidae

Campylenchia latipes Say
Stictocephala basalis (Walker)
Stictocephala bisonia (Kopp and Yke)

Cicadellidae

Aceratagallia arida Oman
Aceratagallia sanguinolenta (Provancher)
Acinopterus viridis Ball
Agallia quadripunctata (Provancher)
Agalliopsis ancistra Oman
Ambysellus grex (Oman)
Amplicephalus (Endria) *inimica* (Say)
Aphrodes bicinctus (Schrank)
Athysanella sp.
Auridius auratus (Gillette and Baker)
Chlorotettix unicolor (Fitch)
Colladonus geminatus (Van Duzee)
Colladonus montanus (Van Duzee)
Deltocephalus lineatifrons Oman
Diplocelenus (Verdanus) *evansi* (Ashmead)
Dorycephalus platyrhnchus Osb.
Draeculacephala novaeboracensis (Fitch)
Empoasca (Kyboasca) *bipunctata* (Osb.)
Euscelidius maculipennis (DeL. and Dav.) (=*schenki* Kirsch)
Extrusanus extrusus (Van Duzee)
Gyponana quebecensis (Provancher)
Hecalus major (Osb.)
Helocharis communis Fitch

Macrosteles fascifrons (Stal)
Prairiana cinerea (Uhler)
Psammotettix lividellus (Zett.)
Sorhoanus uhleri (Oman)
Streptanus deceptus (Sd. and DeLong)

Cercopidae

Philaenarcys bilineata (Say)
Philaenus spumarius (Linnaeus)

Delphacidae

Laccocera vittipennis Van Duzee
Liburna occulusa Van Duzee
Liburna pellucida Fabricius
Liburna sp.

Aphididae

Acyrthosiphon pisum (Harris)
Nearctaphis bakeri (Cowen)
Therioaphis maculata (Buckton)

Psyllidae

Aphalara sp.
Livia sp.
Psylla sp.

The membracids, cicadellids, cercopids, and delphacids are readily found in alfalfa but do not appear to cause any serious damage to the crop. The cicadellids *A. sanguinolenta, C. montanus* and *M. fascifrons* are often present in alfalfa in very large numbers.

The pea aphid, *A. pisum,* has been a major pest of alfalfa, especially in the irrigated areas. It is generally kept under control by early cutting of the crop and by predators and parasites. Populations of both *N. bakeri* and *T. maculata,* the spotted alfalfa aphid, have remained low. *T. maculata* was found for the first time in Alberta in 1981 and may not have had time to become well established. However, it has been a major pest of alfalfa in the southern United States, Australia and New Zealand and could become a serious pest in Alberta as it injects a toxin into the alfalfa as well as damages the plant by its feeding.

Neuroptera

Chrysopidae

Chrysopa carnea Stephens (=*plorobunda* Fitch)
Chrysopa oculata Say

Chrysopa sp. are predaceous on aphids, mites, leafhoppers, psyllids and small lepidoperta. In alfalfa both the above species are common predators of the pea aphid.

Lepidoptera

Noctuidae

Agrotis orthogonia Morrison
Anagrapha (=*Autographa*) *falcifera* (Kirby)
Autographa californica (Speyer)
Discestra (=*Scotogramma*) *trifolii* (Hufnagel)
Euxoa auxiliaris (Grote)
Euxoa ochrogaster (Guenee)

Pieridae

Colias eurytheme Boisduval

Pyralidae

Loxostege cerealis (Zeller)
Loxostege sticticalis (Linnaeus)

The alfalfa looper, *A. californica*, and the alfalfa caterpillar, *C. eurytheme*, are found regularly in alfalfa but have as yet not caused serious problems. Larvae often have a high incidence of disease or parasitism. However, *A. californica* has at times seriously damaged canola in the province. The cutworms *A. orthogonia*, *E. auxiliaris*, *E. ochrogaster* and *D. trifolii* sometimes damage alfalfa but can only be considered to be minor pests. Established alfalfa sometimes harbors high populations of cutworms with no apparent effect. However, seedling alfalfa is sometimes severely affected. *L. sticticalis*, the sugarbeet webworm, is a major pest of sugarbeets in Alberta. Although it and *L. cerealis*, the alfalfa webworm, are commonly present in alfalfa they do not appear to have caused any serious damage.

Coleoptera

Carabidae

Agonum corvus (LeConte)
Agonum placidum (Say)
Amara apricaria (Paykull)
Amara carinata (LeConte)
Amara farcta LeConte
Amara lacustris LeConte
Amara littoralis Mannerheim
Amara obesa (Say)
Amara quenseli (Schonherr)
Amara torrida (Panzer)
Axinopalpus biplagiatus (Dejean)
Bembidion bimaculatum (Kirby)
Bembidion coloradense Hayward
Bembidion mutatum Gemminger and Harold
Bembidion nitidum (Kirby)
Bembidion obscurellum (Motschulsky)
Bembidion praecinctum LeConte
Bembidion quadrimaculatum (Linnaeus)

Bembidion rupicola (Kirby)
Bembidion nr *versicolor* (LeConte)
Bradycellus congener (LeConte)
Bradycellus nigerrimus Lindroth
Calosoma osoletum Say
Harpalellus basilaris (Kirby)
Harpalus amputatus Say
Harpalus fumerarius Csiki
Harpalus nr *uteanus* Casey
Harpalus sp.
Loricera pilicornis (Fabricius)
Metabletus americanus (Dejean)
Microlestes linearis (LeConte)
Notiophilus aquaticus (Linneaus)
Poecilus lucublandus (Say)
Pterostichus melanarius (Illiger)
Stenolophus comma (Fabricius)
Stenolophus conjunctus (Say)

Hydrophilidae

Helophorus orientalis Motsch.

Staphylinidae

Aleochara nr *bimaculata* (Grav.)
Anotylus sobrinus (LeConte)
Gabrius picipennis (Mannh.)
Gnypeta sp.
Leptacinus intermedius Don
Neohypnus hamatus (Say)
Neohypnus obscurus (Er.)
Philonthus concinnus (Grav.)
Philonthus fuscipennis Mannh.
Philonthus lautus Csy.
Philonthus occidentalis Horn
Philonthus sordidus (Grav.)
Philonthus varius (Gyllenhal)
Platystethus americanus Er.
Stenus (*Hypostenus*) *reconditus breviusculus* Puthz
Stenus (s.st.) *morio* Grav.
Stenus (s.st.) *occidentalis* Csy ?
Stenus vicinoides Puthz
Tachyporus inornatus Campbell
Tachyporus mexicanus Sharp
Tachyporus nitidulus (Fabricius)

Silphidae

Aclypea bituberosa (LeConte)

Histeridae

Euspilotus insertus (LeConte)

Scarabaeidae

Aphodius (?) albertanus Brown
Aphodius alternatus Horn
Aphodius granarius (Linneaus)
Aphodius pinguis Hald.
Onthophagus nuchicornis Linnaeus

Eucinetidae

Eucinetus terminalis LeConte

Elateridae

Aeolus mellillus (Say)
Agriotes criddelei Van Dyke
Ctenicera pudica (Brown)
Dalopius pallidus Brown
Hemicrepidius memnonius (Hbst.)
Hypolithus bicolor Esch.
Oedostethus femoralis LeConte

Cantharidae

Cantharis oregonus LeConte
Cantharis sp.

Lampyridae

Ellychnia corrusca (Linnaeus)
Ellychnia lacustris LeConte

Dermestidae

Dermestes sp.

Anobiidae

Caenocara scymnoides LeConte
Xylentinus fucatus LeConte

Cleridae

Phyllobaenus sp.
Trichodes nutalli Kirby

Melyridae

Collops bipunctatus Say
Collops hirtellus LeConte
Collops vittatus Say
Malachius aeneus (Linnaeus)

Meloidae

Epicauta ferruginea (Say)
Epicauta maculata (Say)
Epicauta normalis Werner

Epicauta oregona Horn
Epicauta pensylvanica (DeGeer)
Epicauta puncticollis Mann
Epicauta subglabra (Fall.)
Lytta nuttali Say

Mordellidae

Mordellistena sp.

Tenebrionidae

Blastinus sp.

Anthicidae

Anthicus flavicans LeConte
Anthicus hastatus Casey
Anthicus lutulentus Casey
Anthicus punctulatus LeConte
Notoxus anchora Hentz

Nitulidae

Epuraea sp.

Helodidae

Cyphon variabilis Thunb.

Cryptophagidae

Anchicera sp.
Cryptophagus acutangulus Gyllenhal

Coccinillidae

Adalia bipunctata (Linnaeus)
Adalia frigida (Schneider)
Brumoides septentrionis Weise
Coccinella novemnottata Herbst
Coccinella transversoguttata richardsoni Brown
Coccinella trifasciata perplexa Mulsant
Hippodamia caseyi Johnson
Hippodamia convergens Guerin
Hippodamia glacialis (Fabricius)
Hippodamia parenthesis (Say)
Hippodamia quinquesignata (Kirby)
Hippodamia sinuata crotchi Casey
Hippodamia tredecimpunctata tibialis (Say)
Hyperaspidius vittigerus (LeConte)
Hyperaspis inflexa Casey
Hyperaspis lateralis Mulsant
Hyperaspis quadrivittata LeConte
Hyperaspis undulata (Say)
Scymnus (Pullus) caudalis LeConte

Scymnus (Pullus) postpictus Casey
Scymnus (Pullus) puncticollis LeConte
Scymnus sp.

Phalacridae

Phalacrus sp.
Stillbus apicalis Melsheimer
Stillbus sp.

Lathridiidae

Corticarina sp.
Enicmus mimus Fall.
Melanophthalma sp.

Cerambycidae

Crossidius pullchelus LeConte
Tetraopes femoratus LeConte

Chrysomelidae

Altica sp.
Calligrapha californica coreopsivora Brown
Chaetocnema protensa LeConte
Chaetocnema sp.
Chrysolina sp.
Crepidodera nana (Say)
Disonycha latifrons Schaeffer
Disonycha triangularis (Say)
Entomoscelis americana Brown
Galeruca browni Blake ?
Gastrophysa cyanea Melsheimer
Gastrophysa polygoni (Linnaeus)
Leptinotarsa decemlineata (Say)
Longitarsus sp.
Macrohaltica sp.
Microrhophala vittata (Fabricius)
Monoxia prob. *angularis* (LeConte)
Monoxia puncticollis (Say)
Pachybrachis sp.
Phyllotreta albionica LeConte
Phyllotreta cruciferae (Goeze)
Phyllotreta striolata (Fabricius)
Psylloides convexior LeConte
Psylloides punctulata Melsheimer
Trirhabda attenuata (Say)
Trirhabda nr *borealis* Blake
Trirhabda virgata LeConte

Bruchidae (=Mylabridae)

Acanthoscelides perforatus (Horn)
Bruchus fraterculus Horn
Bruchus seminulum Horn

Curculionidae

Amalus haemorrhous (Hbst.)
Anthonomus sp.
Apion sp.
Ceutorhynchus americanus Buch.
Ceutorhynchus punctiger Gyllenhal
Ceutorhynchus sp.
Euhrychiopsis albertana (Brown)
Grypus equiseti (Fabricius)
Hypera postica (Gyllenhal)
Hypera punctata (Fabricius)
Lepesoma alternata (Horn)
Listronotus sp.
Nanodes canadensis (Brown)
Notaris bimaculata (Fabricius)
Otiorhynchus ovatus (Linnaeus)
Panscopus aequalis (Horn)
Pseudothonomus sp.
Sitona cylindricollis Fahraeus
Sitona hispidulus (Fabricius)
Sitona lepidus Gyllenhal
Sitona scissifrons Say
Tychius picirostris (Fabricius)

Many species of carabids are carnivorous, nocturnal, and typically hunters. They feed on almost any living animal that they can overcome. Some probably feed on aphids that fall off alfalfa plants. Some species of *Amara*, *Harpalus*, and *Pterostichus* are known to destroy seeds, berries, and plants. The ground beetles in alfalfa have not been well studied. Thirty-seven species have been found in alfalfa in Alberta and Vas'kin (1985) reported 53 species on alfalfa in Russia. He reported that the ratio of predatory ground beetles to those with mixed feeding habits was 100:1. The carabid complex appears to be one of the most promising groups of predators for integrated control of insect pests in alfalfa.

Some species of hydrophylids of the genus *Helophorus* feed on roots and leaves of young plants but others are scavengers or predaceous. The family is uncommon in alfalfa.

The staphylinids are mainly carnivorous or saprophagous and are often found around decaying organic matter and dung. Some are predatory on diptera and others are associated with ants. Staphylinids, especially some species of *Tachyporus*, may also feed on aphids that fall off alfalfa plants.

The silphid, A. *bituberosa*, although commonly found in alfalfa does not appear to cause any damage to the crop. It is mainly a pest of sugar beets.

The histerids are associated with carrion or dung but many are saprophagous or predaceous. Their significance in alfalfa is not known.

The scarabaeids are mainly leaf chafers, scavengers and dung feeders. There are over 100 species of dung-feeding *Aphodius* in the prairie and grassland areas of north America.

The elaterids or wireworms are mainly subterranean feeders on seeds and plants in the larval stage. They can ause significant damage in alfalfa that is seeded into newly broken sod.

The cantharids and lampyrids are mainly predaceous families of beetles. The cantharids feed mainly on aphids, meally bugs, and other small insects and are often found in flowers. The lampyrids are predaceous on caterpillars and other insect larvae.

The dermestids and the anobiids generally feed on dead animals and dried plant material.

The clerids and the melyrids are predatory families. *T. nutalli* catches insects such as bees at alfalfa flowers. *C. bipunctatus* and *C. vittatus* feed on aphids.

The meloids are plant feeders as adults but have not been of economic importance on alfalfa in Alberta. The larvae feed on eggs of grasshoppers or brood chambers of ground nesting bees. Adults yield cantharidin which is used medicinally as an aphrodisiac, a vesicator, and a diuretic, and is known as "Spanish Fly". Some species of *Epicauta* are known to cause death to horses when eaten with infested alfalfa hay.

The mordellid larvae live in decaying wood but some species are predatory.

The tenebrionids feed mainly on dead and decaying organic matter. The nitulids are mainly saprophagous in both the adult and larval stages. The cyrptophagids live on fungi and decaying organic matter.

The coccinellids feed mainly on soft-bodied insects such as aphids and coccids and are important predators in alfalfa. Five species important as predators of the pea aphid and readily found in alfalfa fields are *C. transversoguttata richardsoni, H. parenthesis, H. quinquesignata, H. sinuata disjuncta,* and *H. tredecimpunctata*. Two other pea aphid predators that can be found in most fields are *C. trifasciata perplexa* and *C. novemnottata*.

The phalacrids and the latridiids are predatory. *S. apicalis* is a pea aphid predator.

The cerambycid genera *Crossidius* and *Tetraopes* attack roots and stems of small plants.

The chrysomelids are all plant feeders and include: the red turnip beetle, *E. americana;* the Colorado potato beetle, *L. decemlineata;* the three spotted flea beetle, *D. triangularis;* the cabbage flea beetle, *P. albionica;* the crucifera flea beetle, *P. cruciferae;* the striped flea beetle, *P. striolata,* and the hop flea beetle, *P. punctula*. None of these chrysomelids is causing damage to alfalfa in Alberta.

The bruchids are the seed weevils.

The curculonids are the weevils which include: the blue turnip weevil, *C. americanus*; the alfalfa weevil, *H. postica*; the clover weevil, *H. punctata*; the strawberry root weevil, *O. ovatus*; the sweetclover weevil, *S. cylindricollis*; the clover root weevil, *S. hispidulus*; the alfalfa curculio, *S. scissifrons*, and the clover seed weevil. The alfalfa weevil has caused damage to alfalfa on numerous occasions in Alberta. Although the alfalfa curculio is very common in alfalfa fields and can cause seedling damage it does not appear to be of economic importance. The insect has caused damage to sainfoin in Montana.

Diptera

Bibionidae

Bibio sp.

Tabanidae

Chrysops mitis Osten Sacken

Stratiomyiidae

Sargus coprarius (Linnaeus)
Sargus viridis Say
Stratiomys normula Loew

Therevidae

Psilocephala aldrichi Coquillett
Thereva duplicis Coquillett

Asilidae

Asilus sp.
Stenopogon inquinatus Loew

Bombyliidae

Systoechus vulgaris Loew

Dolichopodidae

Dolichopus bifractus Loew
Dolichopus brevipennis Loew
Dolichopus conspectus Van Duzee
Dolichopus jugalis Tucker
Dolichopus plumipes (Scopoli)
Dolichopus ramifer Loew
Dolichopus renidescens M. and B.
Dolichopus sp.
Raphium campestre Cn.
Scellus monstrosus Osten. Sacken

Lonchopteridae

Lonchoptera furcata Fallen

Phoridae

Megaselia sp.

Syrphidae

Eupoedes volucris Osten Sacken
Helophilus latifrons Loew
Metasyrphus lapponicus (Zetterstedt)
Metasyrphus sp.
Scaeva pyrastri (Linnaeus)
Sphaerophoria philanthus (Meigen) (=*robusta* Cn.)
Sphaerophoria sp.
Syritta pipiens (Linnaeus)
Syrphus torvus Osten Sacken
Syrphus vitripennis Meigen

Otitidae

Ceroxys latiusculus (Loew)
Tetanops myopaeformis (Roder)

Tephrididae

Paroxyna pygmaea Novak
Tephritis sp.

Agromyzidae

Liriomya sp.

Lauxanidae

Camptoprosopella borealis Shewell

Heleomyzidae

Pseudoleria sp.

Chloropidae

Thaumatomyia bistriata (Walker)
Thaumatomyia glabra Meigen

Scathophagidae

Scathophaga stercoraria Linnaeus

Anthomyiidae

Hylemya (Delia) extremitata Malloch
Hylemya (Delia) platura (Meigen)
Hylemya (Pegohylemya) fugax (Meigen)
Pegomyia sp.

Muscidae

Helina duplicata (Meigen)
Limosia cilicauda (Malloch)

Musca domestica Linnaeus
Myospila meditabunda (Fabricius)
Ophyra leucostoma (Wiedemann)
Quadrularia laetifica (Rob.-Des.)

Calliphoridae

Bufolucilia silvarum (Meigen)
Pollenia rudis (Fabricius)

Sarcophagidae

Blaesoxipha atlanis (Aldrich)
Blaesoxipha kellyi (Aldrich)
Blaesoxipha sp.
Ravinia querula (Walker)
Sarcophaga harpax (Pandelle)
Sarcophaga sinuata Meigen

Tachinidae

Dinera grisescens (Fallen)
Leucostoma simplex (Fallen)
Peleteria iterans (Walker)

The asilid *S. inquinatus* was reported by Hobbs (1956) to kill honey bees.

The bombyliids of the genus *Systoechus* are reported to be ecto-parasites on beetle larvae living in the soil, especially scarabaeids (Askew 1971).

The dolichopodid are all predatory and the phorid genus *Megaselia* is parasitic, probably on millipeds.

The syrphids are generally predators of aphids. *E. volucris, S. pyrastri, S. philanthus* and *S. torvus* are all important predators of the pea aphid.

The otitid, *T. mypaeformis*, the sugarbeet root maggot, is frequently found in alfalfa fields in the irrigated areas where sugarbeets are grown.

The chloropid genus *Thaumatomyia* is known to be predatory on aphids. *T. glabra* is the most important predator of the sugarbeet root aphid in Alberta and Montana.

M. domestica is the common house fly. Some of the flies in the genus *Ophrya* cause myasis (Askew 1971).

The calliphorid fly *P. rudis* is a parasite of earthworms.

Some sarcophagids in the genus *Blaesoxipha* are parasites of grasshoppers (Askew 1971).

Some species in the genus *Sarcophaga* are parasites of grasshoppers (Askew 1971).

Many of the tachinids parasitize hymenoptera, coleoptera, diptera, lepidoptera and orthoptera (Askew 1971). *L. simplex* is a parasite of the predator *N. alternatus*.

Hymenoptera

Ichneumonidae

Bathyplectes curculionis (Thomson)
Hyposoter sp.

Braconidae

Meteorus proximus Cress.
Dinocampus (=Perlitus) coccinellae Schrank
Wesmalia pendula Foester

Aphidiidae

Aphidius ervi Haliday
Aphidius pulcher Baker
Aphidius smithi Sharma and Subbo Roa
Praon (prob.) *exoletum palitans* Muesbeck
Praon pequodorum Vierck

Pteromalidae

Asaphes suspensus (Nees)
Asaphes vulgaris (Walker)
Pachyneuron sp.

Megachilidae

Megachile brevis Say
Megachile dentitarsus Sladen
Megachile frigida Sm.
Megachile melanophae Sm.
Megachile perhirta Ckll.
Megachile rotundata Fabricius

Apidae

Apis mellifera Linnaeus
Bombus borealis Kirby
Bombus fervidus Fabricius
Bombus huntii Greene
Bombus nevadensis Cress.
Bombus occidentalis Greene
Bombus rufocinctus Cress.
Bombus ternarius Say
Bombus terricola Kirby

Alloxystidae

Alloxysta sp.

Ceraphronidae

Attritomellus (=Dendrocerus) niger (Howard)

Many hymenoptera are parasites, hyperparasites, or pollinators.

The ichneumonid *B. curculionis* is an important parasite of the alfalfa weevil, *H. postica*.

The braconid *M. proximus* is a parasite of the alfalfa caterpillar, *C. eurytheme*. *D. coccinellae* is a parasite of coccinellids which are predators of the pea aphid. *W. pendula* is a parasite of the western damsel bug, *N. alternatus*, which is a predator of the pea aphid and other small insects in alfalfa. Neither *D. coccinellae* nor *W. pendula* appear to severely limit predator populations at present as coccinellids and *N. alternatus* are present in all alfalfa fields in Alberta.

The aphidiid parasites in the genera *Aphidius* and *Praon* are parasites of aphids. They are important in the control of the pea aphid, *A. pisum*. A few specimens of *A. smithi* were found in southern Alberta in 1970. These were augmented by rearing large numbers in the laboratory and in field cages and releasing them thoughout the irrigated areas. The parasite is now well established and has become one of the most important control agents for the pea aphid in the province.

A. suspensus is a hyperparasite of *D. coccinellae* and may be one of the reasons that the parasite of coccinellids is not more important. *A. vulgaris* is a hyperparasite of *Aphidius* spp. and *Charips* spp. It does not appear to seriously reduce populations of *A. smithi*, the most important parasite of *A. pisum* in Alberta.

The megachilids are pollinators of alfalfa. The first five species are native pollinators that nest in sod, while *M. rotundata* is the alfalfa leafcutter bee that has been domesticated for pollination of alfalfa.

A. mellifera, the honey bee, is found in all alfalfa fields but is not an important pollinator of alfalfa.

Bombus species are pollinators but many of them prefer red or sweet clover rather than alfalfa.

Charips spp. are hyperparasites of hymenopterous parasites.

A. niger is a hyperparasite of *D. coccinellidae* and may be quite important in keeping this parasite of coccinellids under control.

Acari

Ameroseiidae

Ameroseius corbicula (Sowerby)

Bdellidae

Biscirus silvaticus (Kramer)

Cunaxidae

Cunaxoides biscutum (Nesbitt)

Erythraeidae

Abrolophus sp.

Oributulidae

Oribatula tibialis (Nicolet)

Phytoseiidae

Amblyseius iroquois Chant and Hansell

Tetranychidae

Petrobia latens (Muller)
Tetranychus urticae (Koch)

Trombiidae

Trombidium sp.

Mites generally are not serious problems in alfalfa in the field. In greenhouses, however, where there are no predators, mites must be frequently controlled by miticides. The tetranychid mites found in alfalfa are of considerable importance; *T. urticae*, the two spotted mite, is often a problem in greenhouses, and *P. latens*, the brown wheat mite, has been a problem on wheat and barley in southern Alberta. Mites in the genus *Amblyseius* are predators on other mites.

INSECT PESTS AND PREDATORS

In alfalfa in Alberta there are a number of insects that are pests or potential pests. These include: the pea aphid, *A. pisum*; the spotted alfalfa aphid, *T. maculata*; the alfalfa weevil, *H. postica*; the alfalfa curculio, *S. scissifrons*; the adelphocorids *A. lineolatus*, *A. superbus* and *A. rapidus*; several *Lygus* spp.; several grasshoppers, *Melanoplus* spp.; the alfalfa caterpillar, *C. eurytheme*; the alfalfa looper, *A. californica*; cutworms, *Euoxa* spp.; the alfalfa webworm, *L. cereralis*; wireworms; the thrips *O. loti*, *F. occidentalis* and *F. tritici*; the lygaeid *P. saskatchewanensis*, and the blister beetles *Epicauta* spp. and *L. nuttali*. The mite genus *Amblysius* is also predatory.

There are also a number of predators and parasites in alfalfa. Predators include: the thrip *A. fasciatus*; anthocorids *A. antevolens*, and *O. tristicolor*; mirids *D. histro*, *D. brevis*, *P. pallidicornis* and *O. obliquus*; the phymatid *P. pennsylvania*; the reduviid *S. diadema*; several nabid species; several geocorids; many carabids; many staphalinids; the cantharid *C. oregonus*; the lampyrids *E. corrusca* and *L. lacustris*; the clerid *T. nutalli*; melyrids *Collops* spp.; several meloids; many coccinellids in the genera *Adalia*, *Brumus*, *Coccinella*, *Hippodamia*, *Hyperaspidius*, *Hyperaspis* and *Scymnus*; the phalacrid *S. apicalis*; several lathridiids; the bombyliid *S. vulgaris*; several dolichopodids, and the chloropids *Thaumatomyia* spp. The parasites include: the sarcophagids *Blaesoxipha* spp.; several tachnids; the ichneumonds *B. curculionis* and *Hyposoter* sp.; the braconids *M. proximus*, *D. coccinellae* and *W. pendula*; the aphidiids *Aphidius* spp. and *Praon* spp.; and the Pteromalids *A. suspensus*, *A. vulgaris* and *Pachyneuron*.

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REFERENCES

Askew, R. R. 1971. Parasitic insects. Am. Elsevier Pub. Co. Inc., New York, New York. 316 pp.

Batulla, B. A. and A. G. Robinson. 1983. A list of predators of aphids (Homoptera: Aphididae) collected in Manitoba. Proc. Entomol. Soc. Manitoba. 39:25-45.

Bierne, B. P. 1971. Pests of annual crops in Canada. I. Lepidoptera. II. Diptera. III. Coleoptera. Memoirs Entomol. Soc. Canada. No. 78. 124 pp.

Bierne, B. P. 1972. Pests of annual crops in Canada. IV. Hemiptera-Homoptera. V. Orthoptera. VI. Other groups. Memoirs Entomol. Soc. Canada. No. 85. 73 pp.

Borrer, D. J. and D. M. Leong. 1963. An introduction to the study of insects. Holt, Rinehart and Winston, New York. 819 pp.

Craig, C. H. 1973. Insect pests of legume and grass crops in western Canada. Agric. Canada Publ. 1435. 19 pp.

Essig, E. O. 1947. College entomology. The MacMillan Company, New York. 900 pp.

Fluke, C. L. 1929. Known predaceous and parasitic enemies of the pea aphid in North America. Agric. Expt. Sta. Univ. Wisc. Bull. 93. 47 pp.

Harper, A. M. 1978. Effects of insecticides on the pea aphid, *Acyrthosiphon pisum* (Hemiptera: Aphididae) and associated fauna on alfalfa. Can. Entomol. 110:891-894.

Harper, A. M. 1981. Forage insects. Pp. 59-66, 71-80 in Alberta Forage Manual. Alberta Agric. Edmonton, Alberta. Agdex 120/20-4.

Harper, A. M. and M. S. Kaldy. 1982. Effect of the pea aphid, *Acyrthosiphon pisum* on yield and quality of forage alfalfa. Can. Entomol. 114:485-489.

Harper, A. M. and H. C. Huang. 1984. Contamination of insects by the plant pathogen *Verticillium albo-atrum* in an alfalfa field. Environ. Entomol. 13:117-120.

Hobbs, G. A. 1950. Pollinating species of bees in irrigated regions of southern Alberta. Rep. 12, Alfalfa Improvement Conf. Pp. 47-51.

Hobbs, G. A. 1956. Ecology of the leaf-cutter bee *Megachile perhirta* Ckll. (Hymenoptera: Megachilidae) in relation to seed production. Can. Entomol. 38(11):625-631

Hobbs, G. A. 1968. Controlling insect enemies of the alfalfa leaf-cutting bee, *Megachile rotundata*. Can. Entomol. 100:781-784.

Hobbs, G. A. and C. E. Lilly. 1954. Ecology of species of *Megachile latreille* in the mixed prairie region of southern Alberta with special reference to pollination of alfalfa. Ecology 35:453-462.

Hodek, I. 1973. Biology of coccinellidae. Academia Publ. House of Czechoslovak Acad. Sci., Prague. 260 pp.

Huang, H. C., A. M. Harper, E. G. Kokko, and R. J. Howard. 1983. Aphid transmission of *Verticillium albo-atrum* to alfalfa. Can. J. Plant Pathol. 5:141-147.

Kelton, L. A. 1980. The insects and arachnids of Canada. Part 8. The plant bugs of the Prairie Provinces of Canada. Heteroptera: Miridae. Research Branch, Agric. Canada Publ. 1703.

Lilly, C. E. 1958. Observations on predation by the plant bug, *Liocoris borealis* Kelton (Hemiptera: Miridae). Can. Entomol. 90:420-421.

Lilly, C. E. and G. A. Hobbs. 1956. Biology of the superb plant bug, *Adelphocoris superbus* (Uhl.), (Hemiptera: Miridae) in southern Alberta. Can. Entomol. 88:118-125.

Pimental, D. and A. G. Wheeler. 1973. Species and diversity of Arthopods in the alfalfa community. Environ. Entomol. 2(4):659-668.

Salt, R. W. 1945. Number of generations of *Lygus hesperus* Knt. and *L. elisus* Van D. in Alberta. Sci. Agric. 25:573-576.

Sopp, P. and S. D. Wratten. 1986. Rates of consumption of cereal aphids by some polyphagus predators in the laboratory. Entomol. Exp. Appl. 41:69-74.

Stary, P. 1974. Population dynamics, parasitism, control, and prognosis of the pea aphid (*Acyrthosiphon pisum* Harris) in Czechoslovakia. Discussions Mathematics and Natural Science. Czechoslovak. Acad. Sci., Prague 84(3):1-123.

Vas'kin, D. V. 1985. Integrated protection of seed lucerne against insect pests. Zashchita rastenii [Plant protection] 11:23-25. (English translation).

Appendix I. List of Species of Insects in Alfalfa in Alberta

Acalypta nyctalis Drake	Hemiptera	Tingidae
Acanthoscelides perforatus (Horn)	Coleoptera	Bruchidae
Aceratagallia arida Oman	Homoptera	Cicadellidae
Aceratagallia sanguinolenta (Provancher)	Homoptera	Cicadellidae
Acinopterus viridis Ball	Homoptera	Cicadellidae
Aclypea bituberosa (LeConte)	Coleoptera	Silphidae
Acyrthosiphon pisum (Harris)	Homoptera	Aphididae
Adalia bipunctata (Linnaeus)	Coleoptera	Coccinellidae
Adalia frigida (Schneider)	Coleoptera	Coccinellidae
Adelphocoris lineolatus (Goeze)	Hemiptera	Miridae
Adelphocoris rapidus (Say)	Hemiptera	Miridae
Adelphocoris superbus (Uhler)	Hemiptera	Miridae
Aeolothrips fasciatus (Linnaeus)	Thysanoptera	Aeolothripidae
Aeolus mellillus (Say)	Coleoptera	Elateridae
Agallia quadripunctata (Provancher)	Homoptera	Cicadellidae
Agalliopsis ancistra Oman	Homoptera	Cicadellidae
Agonum corvus (LeConte)	Coleoptera	Carabidae
Agonum placidum (Say)	Coleoptera	Carabidae
Agriotes criddelei Van Dyke	Coleoptera	Elateridae
Agrotis orthogonia Morrison	Lepidoptera	Noctuidae
Aleochara nr *bimaculata* (Grav.)	Coleoptera	Staphylinidae
Alloxysta sp.	Hymenoptera	Alloxystidae
Altica sp.	Coleoptera	Chrysomelidae
Alydus conspersus (Montandon)	Hemiptera	Coreidae
Alydus eurinus Say	Hemiptera	Coreidae
Amalus haemorrhous (Hbst.)	Coleoptera	Curculionidae
Amara apricara (Paykull)	Coleoptera	Carabidae
Amara carinata (LeConte)	Coleoptera	Carabidae
Amara farcta LeConte	Coleoptera	Carabidae
Amara lacustris LeConte	Coleoptera	Carabidae
Amara littoralis Mannerheim	Coleoptera	Carabidae
Amara obesa (Say)	Coleoptera	Carabidae
Amara quenseli (Schonherr)	Coleoptera	Carabidae
Amara torrida (Panzer)	Coleoptera	Carabidae

Ambysellus grex (Oman)	Homoptera	Cicadellidae
Amplicephalus (Endria) *inimica* (Say)	Homoptera	Cicadellidae
Anabrus simplex Haldeman	Orthoptera	Tettigoniidae
Anagrapha falcifera (Kirby)	Lepidoptera	Noctuidae
Anchicera sp.	Coleoptera	Cryptophagidae
Anotylus sobrinus (LeConte)	Coleoptera	Staphylinidae
Anthicus flavicans LeConte	Coleoptera	Anthicidae
Anthicus hastatus Casey	Coleoptera	Anthicidae
Anthicus lutulentus Casey	Coleoptera	Anthicidae
Anthicus punctulatus LeConte	Coleoptera	Anthicidae
Anthocoris antevolens White	Hemiptera	Anthocoridae
Anthonomus sp.	Coleoptera	Curculionidae
Aphalara sp.	Homoptera	Psyllidae
Aphidius ervi Haliday	Hymenoptera	Aphidiidae
Aphidius pulcher Baker	Hymenoptera	Aphidiidae
Aphidius smithi Sharma and Subbo Roa	Hymenoptera	Aphidiidae
Aphodius (?) *albertanus* Brown	Coleoptera	Scarabaeidae
Aphodius alternatus Horn	Coleoptera	Scarabaeidae
Aphodius granarius (Linneaus)	Coleoptera	Scarabaeidae
Aphodius pinguis Hald.	Coleoptera	Scarabaeidae
Aphrodes bicinctus (Schrank)	Homoptera	Cicadellidae
Apion sp.	Coleoptera	Cnidae
Apis mellifera Linnaeus	Hymenoptera	Apidae
Asaphes suspensus (Nees)	Hymenoptera	Pteromalidae
Asaphes vulgaris (Walker)	Hymenoptera	Pteromalidae
Asilus sp.	Diptera	Asilidae
Athysanella sp.	Homoptera	Cicadellidae
Atomoscelis modestus (Van Duzee)	Hemiptera	Miridae
Attritomellus niger (Howard)	Hymenoptera	Ceraphonidae
Auridius auratus (Gillette and Baker)	Homoptera	Cicadellidae
Autographa californica (Speyer)	Lepidoptera	Noctuidae
Axinopalpus biplagiatus Dejean	Coleoptera	Carabidae
Bathyplectes curculionis (Thomson)	Hymenoptera	Ichneumonidae
Bembidion bimaculatum (Kirby)	Coleoptera	Carabidae
Bembidion coloradense Hayward	Coleoptera	Carabidae

Bembidion mutatum Gemminger and Harold	Coleoptera	Carabidae
Bembidion nitidum (Kirby)	Coleoptera	Carabidae
Bembidion obscurellum (Motschulsky)	Coleoptera	Carabidae
Bembidion praecinctum LeConte	Coleoptera	Carabidae
Bembidion quadrimaculatum (Linnaeus)	Coleoptera	Carabidae
Bembidion rupicola (Kirby)	Coleoptera	Carabidae
Bembidion nr *versicolor* (LeConte)	Coleoptera	Carabidae
Bibio sp.	Diptera	Bibionidae
Blaesoxipha atlanis (Aldrich)	Diptera	Sarcophagidae
Blaesoxipha kellyi (Aldrich)	Diptera	Sarcophagidae
Blaesoxipha sp.	Diptera	Sarcophagidae
Blastinus sp.	Coleoptera	Tenebrionidae
Bombus borealis Kirby	Hymenoptera	Apidae
Bombus fervidus Fabricius	Hymenoptera	Apidae
Bombus huntii Greene	Hymenoptera	Apidae
Bombus nevadensis Cress.	Hymenoptera	Apidae
Bombus occidentalis Greene	Hymenoptera	Apidae
Bombus rufocinctus Cress.	Hymenoptera	Apidae
Bombus ternarius Say	Hymenoptera	Apidae
Bombus terricola Kirby	Hymenoptera	Apidae
Bourletiella hortensis (Fitch)	Collembola	Sminthuridae
Bradycellus congener (LeConte)	Coleoptera	Carabidae
Bradycellus nigerrimus Lindroth	Coleoptera	Carabidae
Bruchus fraterculus Horn	Coleoptera	Bruchidae
Bruchus seminulum Horn	Coleoptera	Bruchidae
Brumoides septentrionis Weise	Coleoptera	Coccinellidae
Bufolucilia silvarum (Meigen)	Diptera	Calliphoridae
Caenocara scymnoides LeConte	Coleoptera	Anobiidae
Calligrapha californica coreopsivora Brown	Coleoptera	Chrysomelidae
Calosoma osoletum Say	Coleoptera	Carabidae
Camnula pellucida (Scudder)	Orthoptera	Acrididae
Camptoprosopella borealis Shewell	Diptera	Lauxanidae
Campylenchia latipes Say	Homoptera	Membracidae
Cantharis oregonus LeConte	Coleoptera	Cantharidae

Cantharis sp.	Coleoptera	Cantharidae
Capsus simulans (Stal)	Hemiptera	Miridae
Carpocoris remotus Horvath	Hemiptera	Pentatomidae
Ceroxys latiusculus (Loew)	Diptera	Otitidae
Ceutorhynchus americanus Buch.	Coleoptera	Curculionidae
Ceutorhynchus punctiger Gyllenhal	Coleoptera	Curculionidae
Ceutorhynchus sp.	Coleoptera	Curculionidae
Chaetocnema protensa LeConte	Coleoptera	Chrysomelidae
Chaetocnema sp.	Coleoptera	Chrysomelidae
Chirothrips manicatus Haliday	Thysanoptera	Chirothripidae
Chirothrips nr *productus*	Thysanoptera	Chirothripidae
Chlamydatus pulicarius (Fallen)	Hemiptera	Miridae
Chlamydatus pullus (Reuter)	Hemiptera	Miridae
Chlorotettix unicolor (Fitch)	Homoptera	Cicadellidae
Chryptophagus acutangulus Gyllenhal	Coleoptera	Cryptophagidae
Chrysolina sp.	Coleoptera	Chrysomelidae
Chrysopa carnea Stephens	Neuroptera	Chrysopidae
Chrysopa oculata Say	Neuroptera	Chrysopidae
Chrysopa plorobunda see *C. Carnea*	Neuroptera	Chrysopidae
Chrysops mitis Osten Sacken	Diptera	Tabinida
Coccinella novemnottata Herbst	Coleoptera	Coccinellidae
Coccinella transversoguttata richardsoni Brown	Coleoptera	Coccinellidae
Coccinella trifasciata perplexa Mulsant	Coleoptera	Coccinellidae
Codophila remotus (How.)	Hemiptera	Pentatomidae
Coenus delius (Say)	Hemiptera	Pentatomidae
Colias eurytheme Boisduval	Lepidoptera	Pieridae
Colladonus geminatus (Van Duzee)	Homoptera	Cicadellidae
Colladonus montanus (Van Duzee)	Homoptera	Cidadellidae
Collops bipunctatus Say	Coleoptera	Melyridae
Collops hirtellus LeConte	Coleoptera	Melyridae
Collops vittatus Say	Coleoptera	Melyridae
Corimelaena pulicaria (Germ)	Hemiptera	Cydnidae
Coriomerus humulis Uhler	Hemiptera	Coreidae
Coriza sp.	Hemiptera	Corizidae

Corizus sp.	Hemiptera	Miridae
Corticarina sp.	Coleoptera	Lathridiidae
Corythucha coryli O. and D.	Hemiptera	Tingidae
Cosmopepla bimaculata Thomas	Hemiptera	Pentatomidae
Crepidodera nana (Say)	Coleoptera	Chrysomelidae
Crossidius pullchelus LeConte	Coleoptera	Cerambycidae
Cryptophagus acutangulus Gyllenhal	Coleoptera	Cryptophagidae
Ctenicera pudica (Brown)	Coleoptera	Elateridae
Cymus luridis Stal	Hemiptera	Lygaeidae
Cyphon variabilis Thunb.	Coleoptera	Helodidae
Dalopius pallidus Brown	Coleoptera	Elateridae
Deltocephalus lineatifrons Oman	Homoptera	Cicadellidae
Dendrocerus see *Attritomellus*	Hymenoptera	Ceraphonidae
Deraeocoris brevis (Uhler)	Hemiptera	Miridae
Deraeocoris histrio (Reuter)	Hemiptera	Miridae
Dermestes sp.	Coleoptera	Dermestidae
Deuterosminthurus repandus (Agren.)	Collembola	Sminthuridae
Dinera grisescens (Fallen)	Diptera	Tachinidae
Dinocampus coccinellae Schrank	Hymenoptera	Braconidae
Diplocelenus (Verdanus) *evansi* (Ashmead)	Homoptera	Cicadellidae
Discestra trifolii (Hufnagel)	Lepidoptera	Noctuidae
Disonycha latifrons Schaeffer	Coleoptera	Chrysomelidae
Disonycha triangularis (Say)	Coleoptera	Chrysomelidae
Dolichonabis propinguus (Reuter)	Hemiptera	Nabidae
Dolichopus bifractus Loew	Diptera	Dolichopodidae
Dolichopus brevipennis Loew	Diptera	Dolichopodidae
Dolichopus conspectus Van Duzee	Diptera	Dolichopodidae
Dolichopus jugalis Tucker	Diptera	Dolichopodidae
Dolichopus plumipes (Scopoli)	Diptera	Dolichopodidae
Dolichopus ramifer Loew	Diptera	Dolichopodidae
Dolichopus renidescens M. and B.	Diptera	Dolichopodidae
Dolichopus sp.	Diptera	Dolichopodidae
Dorycephalus platyrhnchus Osb.	Homoptera	Cicadellidae
Draeculacephala novaeboracensis (Fitch)	Homoptera	Cicadellidae
Ellychnia corrusca (Linnaeus)	Coleoptera	Lampyridae

Ellychnia lacustris LeConte	Coleoptera	Lampyridae
Emblethis vicarius Horvath	Hemiptera	Lygaeidae
Empoasca (Kyboasca) *bipunctata* (Osb.)	Homoptera	Cicadellidae
Enicmus mimus Fall.	Coleoptera	Lathridiidae
Entomoscelis americana Brown	Coleoptera	Chrysomelidae
Epicauta ferruginea (Say)	Coleoptera	Meloidae
Epicauta maculata (Say)	Coleoptera	Meloidae
Epicauta normalis Werner	Coleoptera	Meloidae
Epicauta oregona Horn	Coleoptera	Meloidae
Epicauta pensylvanica (DeGeer)	Coleoptera	Meloidae
Epicauta puncticollis Mann	Coleoptera	Meloidae
Epicauta subglabra (Fall.)	Coleoptera	Meloidae
Epuraea sp.	Coleoptera	Nitulidae
Eucinetus terminalis LeConte	Coleoptera	Eucinetidae
Euhrychiopsis albertana (Brown)	Coleoptera	Curculionidae
Eupoedes volucris Osten Sacken	Diptera	Syrphidae
Euscelidius maculipennis (DeL. and Dav.)	Homoptera	Cicadellidae
Euspilotus insertus (LeConte)	Coleoptera	Histeridae
Euxoa auxiliaris (Grote)	Lepidoptera	Noctuidae
Euxoa ochrogaster (Guenee)	Lepidoptera	Noctuidae
Extrusanus extrusus (Van Duzee)	Homoptera	Cicadellidae
Frankliniella occidentalis (Pergarde)	Thysanoptera	Thripidae
Frankliniella tritici (Fitch)	Thysanoptera	Thripidae
Gabrius picipennis (Mannh.)	Coleoptera	Staphylinidae
Galeruca browni Blake ?	Coleoptera	Chrysomelidae
Gastrophysa cyanea Melsheimer	Coleoptera	Chrysomelidae
Gastrophysa polygoni (Linnaeus)	Coleoptera	Chrysomelidae
Geocoris atricolor Mont.	Hemiptera	Lygaeidae
Geocoris bullatus Say	Hemiptera	Lygaeidae
Geocoris discopterus (Stal)	Hemiptera	Lygaeidae
Geocoris nr *pallens*	Hemiptera	Lygaeidae
Geocoris uliginosis Say	Hemiptera	Lygaeidae
Gnypeta sp.	Coleoptera	Staphylinidae
Grypus equiseti (Fabricius)	Coleoptera	Curculionidae
Gyponana quebecensis (Provancher)	Homoptera	Cicidallidae
Hadronema militaris Uhler	Hemiptera	Miridae

Halothrips malifloris complex	Thysanoptera	Phleothripidae
Harpalellus basilaris (Kirby)	Coleoptera	Carabidae
Harpalus amputatus Say	Coleoptera	Carabidae
Harpalus fumerarius Csiki	Coleoptera	Carabidae
Harpalus nr *uteanus* Casey	Coleoptera	Carabidae
Harpalus sp.	Coleoptera	Carabidae
Hecalus major (Osb.)	Homoptera	Cicadellidae
Helina duplicata (Meigen)	Diptera	Muscidae
Helocharis communis Fitch	Homoptera	Cidadellidae
Helophilus latrifrons Loew	Diptera	Syrphidae
Helophorus orientalis Motsch.	Coleoptera	Hydrophilidae
Hemicrepidius memnonius (Hbst.)	Coleoptera	Elateridae
Hippodamia caseyi Johnson	Coleoptera	Coccinellidae
Hippodamia convergens Guerin	Coleoptera	Coccinellidae
Hippodamia glacialis (Fabricius)	Coleoptera	Coccinellidae
Hippodamia parenthesis (Say)	Coleoptera	Coccinellidae
Hippodamia quinquesignata (Kirby)	Coleoptera	Coccinellidae
Hippodamia sinuata crotchi Casey	Coleoptera	Coccinellidae
Hippodamia tredecimpunctata tibialis (Say)	Coleoptera	Coccinellidae
Holcostethus limbolarius Stal	Hemiptera	Scutelleridae
Homaemus aeneifrons consors Uhler	Hemiptera	Scutelleridae
Hylemya (Delia) extremitata Malloch	Diptera	Anthomyiidae
Hylemya (Delia) platura (Meigen)	Diptera	Anthomyiidae
Hylemya (Pegohylemya) fugax (Meigen)	Diptera	Anthomyiidae
Hypera postica (Gyllenhal)	Coleoptera	Curculionidae
Hypera punctata (Fabricius)	Coleoptera	Curculionidae
Hyperaspidius vittigerus (LeConte)	Coleoptera	Coccinellidae
Hyperaspis inflexa Casey	Coleoptera	Coccinellidae
Hyperaspis lateralis Mulsant	Coleoptera	Coccinellidae
Hyperaspis quadrivittata LeConte	Coleoptera	Coccinellidae
Hyperaspis undulata (Say)	Coleoptera	Coccinellidae
Hypogastrura manubrialis (Tullberg)	Collembola	Poduridae
Hypolithus bicolor Esch.	Coleoptera	Elateridae
Hyposoter sp.	Hymenoptera	Ichneumonidae
Ilnacora nr *albifrons* Knight	Hemiptera	Miridae

Labops hesperus Uhler	Hemiptera	Miridae
Labops simulans Stal	Hemiptera	Miridae
Laccocera vittipennis Van Duzee	Homoptera	Delphacidae
Lepesoma alteranata (Horn)	Coleoptera	Curculionidae
Leptacinus intermedius Don	Coleoptera	Staphylinidae
Leptinotarsa decemlineata (Say)	Coleoptera	Chrysomelidae
Leucostoma simplex (Fallen)	Diptera	Tachinidae
Liburna occulusa Van Duzee	Homoptera	Delphacidae
Liburna pellucida (Fabricius)	Homoptera	Delphacidae
Liburna sp.	Homoptera	Delphacidae
Ligyrocoris sylvestris (Linnaeus)	Hemiptera	Lygaeidae
Limosia cilicauda (Malloch)	Diptera	Muscidae
Limothrips denticornis Haliday	Thysanoptera	Thripidae
Liriomya sp.	Diptera	Agromyzidae
Listronotus sp.	Coleoptera	Curculionidae
Litomeris debilis (Uhler)	Hemiptera	Miridae
Livia sp.	Homoptera	Psyllidae
Lonchoptera furcata Fallen	Diptera	Lonchopteridae
Longitarsus sp.	Coleoptera	Chrysomelidae
Lopidea dakota Knight	Hemiptera	Miridae
Lopus sp.	Hemiptera	Miridae
Loricera pilicornis (Fabricius)	Coleoptera	Carabidae
Loxostege cereralis (Zeller)	Lepidoptera	Pyralidae
Loxostege sticticalis (Linnaeus)	Lepidoptera	Pyralidae
Lygaeus kalmii Stal	Hemiptera	Lygaeidae
Lygidea sp.	Hemiptera	Miridae
Lygus borealis (Kelton)	Hemiptera	Miridae
Lygus desertinus Knight	Hemiptera	Miridae
Lygus elisus Van Duzee	Hemiptera	Miridae
Lygus lineolaris (Palisot de Beauvois)	Hemiptera	Miridae
Lygus rufidorsus (Kelton)	Hemiptera	Miridae
Lygus shulli (Knight)	Hemiptera	Miridae
Lygus unctuosus Kelton	Hemiptera	Miridae
Lytta nuttali Say	Coleoptera	Meloidae
Macrohaltica sp.	Coleoptera	Chrysomelidae
Macrosteles fascifrons (Stal)	Homoptera	Cicadellidae

Malachius aeneus (Linnaeus)	Coleoptera	Melyridae
Megachile brevis Say	Hymenoptera	Megachilidae
Megachile dentitarsus Sladen	Hymenoptera	Megachilidae
Megachile frigida Sm.	Hymenoptera	Megachilidae
Megachile melanophae Sm.	Hymenoptera	Megachilidae
Megachile perhirta Ckll.	Hymenoptera	Megachilidae
Megachile rotundata Fabricius	Hymenoptera	Megachilidae
Megalotamus quinquespinosus Say	Hemiptera	Coreidae
Megaselia sp.	Diptera	Phoridae
Melanophthalma sp.	Coleoptera	Lathridiidae
Melanoplus bivittatus (Say)	Orthoptera	Acrididae
Melanoplus femurrubrum (DeGeer)	Orthoptera	Acrididae
Melanoplus packardii Scudder	Orthoptera	Acrididae
Melanoplus sanguinipes (Fabricius)	Orthoptera	Acrididae
Melanotrichus coagulatus (Uhler)	Hemiptera	Miridae
Melanotrichus flavosparsus (Sahlberg)	Hemiptera	Miridae
Metabletus americanus (Dejean)	Coleoptera	Carabidae
Metasyrphus lapponicus (Zetterstedt)	Diptera	Syrphidae
Metasyrphus sp.	Diptera	Syrphidae
Meteorus proximus Cress.	Hymenoptera	Braconidae
Microlestes linearis (LeConte)	Coleoptera	Carabidae
Microrhophala vittata (Fabricius)	Coleoptera	Chrysomelidae
Mimoceps insignis Uhler	Hemiptera	Miridae
Monoxia prob. *angularis* (LeConte)	Coleoptera	Chrysomelidae
Monoxia puncticollis (Say)	Coleoptera	Chrysomelidae
Mordellistena sp.	Coleoptera	Mordellidae
Musca domestica Linnaeus	Diptera	Muscidae
Myospila meditabunda (Fabricius)	Diptera	Muscidae
Nabis alternatus Parshley	Hemiptera	Nabidae
Nabis limbatus Dahlbom	Hemiptera	Nabidae
Nabis subcoleoptratus (Kirby)	Hemiptera	Nabidae
Nabis van duzee Kirk	Hemiptera	Nabidae
Nanodes canadensis (Brown)	Coleoptera	Curculionidae
Nearctaphis bakeri (Cowen)	Homoptera	Aphididae
Neohypnus hamatus (Say)	Coleoptera	Staphylinidae
Neohypnus obscurus (Er.)	Coleoptera	Staphylinidae

Neottiglossa undata Say	Hemiptera	Pentatomidae
Notaris bimaculata (Fabricius)	Coleoptera	Curculionidae
Notiophilus aquaticus (Linneaus)	Coleoptera	Carabidae
Notoxus anchora Hentz	Coleoptera	Anthicidae
Nysius ericae Schilling	Hemiptera	Lygaeidae
Nysius minutus Uhler	Hemiptera	Lygaeidae
Odontothrips loti (Haliday)	Thysanoptera	Thripidae
Oedostethus femoralis LeConte	Coleoptera	Elateridae
Onthophagus nuchicornis Linnaeus	Coleoptera	Scarabaeidae
Ophyra leucostoma (Wiedemann)	Diptera	Muscidae
Orectoderus obliquus Uhler	Hemiptera	Miridae
Orius tristicolor (White)	Hemiptera	Anthocoridae
Orthotylus fusicornis Knight	Hemiptera	Miridae
Otiorhynchus ovatus (Linnaeus)	Coleoptera	Curculionidae
Pachybrachis sp.	Coleoptera	Chrysomelidae
Pachyneuron sp.	Hymenoptera	Pteromalidae
Panscopus aequalis (Horn)	Coleoptera	Curculionidae
Paroxyna pygmaea Novak	Diptera	Tephrididae
Pegomyia sp.	Diptera	Anthomyiidae
Peleteria iterans (Walker)	Diptera	Tachinidae
Perilitus see *Dinocampus*	Hymenoptera	Braconidae
Peritrichus saskatchewanensis Barb.	Hemiptera	Lygaeidae
Phalacrus sp.	Coleoptera	Phalacridae
Philaenarcys bilineata (Say)	Homoptera	Cercopidae
Philaenus spumarius (Linnaeus)	Homoptera	Cercopidae
Philonthus concinnus Grav.	Coleoptera	Staphylinidae
Philonthus fuscipennis Mannh.	Coleoptera	Staphylinidae
Philonthus lautus Csy.	Coleoptera	Staphylinidae
Philonthus occidentalis Horn	Coleoptera	Staphylinidae
Philonthus sordidus (Grav.)	Coleoptera	Staphylinidae
Philonthus varius (Gyllenhal)	Coleoptera	Staphylinidae
Phyllobaenus sp.	Coleoptera	Cleridae
Phyllotreta albionica LeConte	Coleoptera	Chrysomelidae
Phyllotreta cruciferae (Goeze)	Coleoptera	Chrysomelidae
Phyllotreta striolata (Fabricius)	Coleoptera	Chrysomelidae
Phymata pennsylvania Handl.	Hemiptera	Phymatidae

Phytocoris pallidicornis Reuter	Hemiptera	Miridae
Piesma cinerea Say	Hemiptera	Piesmidae
Plagiognathus obscurus Uhler	Hemiptera	Miridae
Plagniognathus sp.	Hemiptera	Miridae
Platystethus americanus Er.	Coleoptera	Staphylinidae
Podisus placidus Uhler	Hemiptera	Pentatomidae
Poecilus lucublandus (Say)	Coleoptera	Carabidae
Pollenia rudis (Fabricius)	Diptera	Calliphoridae
Polymerus prob. *rufipes* Knight	Hemiptera	Miridae
Prairiana cinerea (Uhler)	Homoptera	Cicadellidae
Praon prob. *exoletum palitans* Muesbeck	Hymenoptera	Aphidiidae
Praon pequodorum Vierck	Hymenoptera	Aphidiidae
Psammotettix lividellus (Zett.)	Homoptera	Cicidellidae
Pseudoleria sp.	Diptera	Heleomyzidae
Pseudothonomus sp.	Coleoptera	Curculionidae
Psilocephala aldrichi Coquillett	Diptera	Therevidae
Psylla sp.	Homoptera	Psyllidae
Psylloides convexior LeConte	Coleoptera	Chrysomelidae
Psylloides punctulata Melsheimer	Coleoptera	Chrysomelidae
Pterostichus melanarius (Illiger)	Coleoptera	Carabidae
Quadrularia laetifica (Rob.-Des.)	Diptera	Muscidae
Raphium campestre Cn.	Diptera	Dolichopodidae
Ravinia querula (Walker)	Diptera	Sarcophagidae
Rhopalus crassicornis (Linnaeus)	Hemiptera	Coreidae
Saldula palustris (Douglas)	Hemiptera	Saldidae
Sarcophaga harpax (Pandelle)	Diptera	Sarcophagidae
Sarcophaga sinuata Meigen	Diptera	Sarcophagidae
Sargus coprarius (Linnaeus)	Diptera	Stratiomyiidae
Sargus viridis Say	Diptera	Stratiomyiidae
Scaeva pyrastri (Linnaeus)	Diptera	Syrphidae
Scathophaga stercoraria Linnaeus	Diptera	Scathophagidae
Scellus monstrosus Osten. Sacken	Diptera	Dolichopodidae
Sciocoris microphthalmus Flor.	Hemiptera	Pentatomidae
Scotogramma see *Discestra*	Lepidoptera	Noctuidae
Scymnus (Pullus) caudalis LeConte	Coleoptera	Coccinellidae
Scymnus (Pullus) postpictus Casey	Coleoptera	Coccinellidae

Scymnus (Pullus) puncticollis LeConte	Coleoptera	Coccinellidae
Scymnus sp.	Coleoptera	Coccinellidae
Sehirus cinctus (Palisot de Beauvois)	Hemiptera	Cydnidae
Sinea diadema Fabricius	Hemiptera	Reduviidae
Sitona cylindricollis Fahraeus	Coleoptera	Curculionidae
Sitona hispidulus (Fabricius)	Coleoptera	Curculionidae
Sitona lepidus Gyllenhal	Coleoptera	Curculionidae
Sitona scissifrons Say	Coleoptera	Curculionidae
Slaterobius insignis (Uhler)	Hemiptera	Lygaeidae
Slaterocoris prob. *stygicus* Say	Hemiptera	Miridae
Sminthurinus elegans (Fitch)	Collembola	Sminthuridae
Sminthurinus medialis (Mills)	Collembola	Sminthuridae
Sorhoanus uhleri (Oman)	Homoptera	Cicidellidae
Sphaerophoria philanthus (Meigen)	Diptera	Syrphidae
Sphaerophoria robusta see *S. philanthus*	Diptera	Syrphidae
Sphaerophoria sp.	Diptera	Syrphidae
Sphragisticus nebulosus (Fall.)	Hemiptera	Lygaeidae
Stenodema trispinosum (Reuter)	Hemiptera	Miridae
Stenodema vicinum (Provancher)	Hemiptera	Miridae
Stenodema virens Linnaeus	Hemiptera	Miridae
Stenolophus comma (Fabricius)	Coleoptera	Carabidae
Stenolophus conjunctus (Say)	Coleoptera	Carabidae
Stenopogon inquinatus Loew	Diptera	Asilidae
Stenus (Hypostenus) reconditus breviusculus Puthz	Coleoptera	Staphylinidae
Stenus (s.st.) *morio* Grav.	Coleoptera	Staphylinidae
Stenus (s.st.) *occidentalis* Csy ?	Coleoptera	Staphylinidae
Stenus vicinoides Puthz	Coleoptera	Staphylinidae
Stictocephala basalis (Walker)	Homoptera	Membracidae
Stictocephala bisonia (Kopp and Yke)	Homoptera	Membracidae
Stictopleuris punctiventris (Dallas)	Hemiptera	Coreidae
Stictopleuris viridicatus (Uhler)	Hemiptera	Coreidae
Stillbus apicalis Melsheimer	Coleoptera	Phalacridae
Stillbus sp.	Coleoptera	Phalacridae
Stratiomys normula Loew	Diptera	Stratiomyiidae
Streptanus deceptus (Sd. and DeLong)	Homoptera	Cicidellidae

Syritta pipiens (Linnaeus)	Diptera	Syrphidae
Syrphus torvus Osten Sacken	Diptera	Syrphidae
Syrphus vitripennis Meigen	Diptera	Syrphidae
Systoechus vulgaris Loew	Diptera	Bombyliidae
Tachyporus inornatus Campbell	Coleoptera	Staphylinidae
Tachyporus mexicanus Sharp	Coleoptera	Staphylinidae
Tachyporus nitidulus (Fabricius)	Coleoptera	Staphylinidae
Tephritis sp.	Diptera	Tephridídae
Tetanops myopaeformis (Roder)	Diptera	Otitidae
Tetraopes femoratus LeConte	Coleoptera	Cerambydidae
Thaumatomyia bistriata (Walker)	Diptera	Chloropidae
Thaumatomyia glabra Meigen	Diptera	Chloropidae
Thereva duplicis Coquillett	Diptera	Therevidae
Therioaphis maculata (Buckton)	Homoptera	Aphididae
Thrips tabaci Lindeman	Thysanoptera	Thripidae
Thyanta punctiventris Van Duzee	Hemiptera	Pentatomidae
Trichodes nutalli Kirby	Coleoptera	Cleridae
Trigonotylus coelestialium (Kirkaldy)	Hemiptera	Miridae
Trigonotylus ruficornis (Geoffroy)	Hemiptera	Miridae
Trirhabda attenuata (Say)	Coleoptera	Chrysomelidae
Trirhabda nr *borealis* Blake	Coleoptera	Chrysomelidae
Trirhabda virgata LeConte	Coleoptera	Chrysomeiidae
Tychius picirostris (Fabricius)	Coleoptera	Curculionidae
Wesmalia pendula Foester	Hymenoptera	Braconidae
Xylentinus fucatus LeConte	Coleoptera	Anobiidae
Xylocoris umbrinus (Van Duzee)	Hemiptera	Miridae
Xylocoris umbrinus Van Duzee	Hemiptera	Anthocoridae
Zeridoneus costalis Van Duzee	Hemiptera	Lygaeidae

Appendix II. Species of Mites in Alfalfa

Abrolophus sp.	Acari	Erythraeidae
Amblyseius iroquois Chant and Hansell	Acari	Phytoseiidae
Ameroseius corbicula (Sowerby)	Acari	Ameroseiidae
Biscirus silvaticus (Kramer)	Acari	Bdellidae
Cunaxoides biscutum (Nesbitt)	Acari	Cunaxidae
Oribatula tibialis (Nicolet)	Acari	Oritubulidae
Petrobia latens (Muller)	Acari	Tetranychidae
Tetranychus urticae (Koch)	Acari	Tetranychidae
Trombidium sp.	Acari	Trombiidae